REMARKS

Claims 1-48 are pending upon entry of this Amendment and Response; claim 32 was previously withdrawn, and claims 33-48 are new.

Claims 1-8, 10-18 and 20-28 stand rejected under 35 U.S.C. 102(b) in view of U.S. Patent No. 4,526,558 to Durham. Claims 1-8, 10-18, 20-29 and 31 also stand rejected under 35 U.S.C. 102(b) in view of U.S. Patent No. 6,155,943 to Ledvina et al. Claims 9 and 19 stand rejected under 35 U.S.C. §103(a) in view of Durham.

Applicant respectfully submits that neither Durham nor Ledvina provides the required prima facie evidence necessary to support the rejections of the presented claims under 35 U.S.C. §§102(b) or 103(a). The Office action acknowledges that neither reference explicitly discloses or suggests a sprocket or method for reducing chain tensions. The references cannot inherently anticipate a claim unless each ***necessarily*** discloses every claimed aspect of an invention, *i.e.,* the reference's alleged inherent disclosure must ***always and inevitably*** satisfy each and every claim element. *See, e.g., Transclean Corp v. Bridgewood Services, Inc.*, 290 F.3d 1364, 1373, 62 U.S.P.Q. 2d 1865 (Fed. Cir. 2002)(the reference "must necessarily include the unstated limitation", it is not enough that product might result in the invention under some circumstances); *In re Robertson*, 169 F.3d 743, 745, 49 U.S.P.Q. 2d 1949 (Fed. Cir. 1999)(reversing the Board for failing to prove that the claimed product was necessarily present in the reference).

This requires, at minimum, prima facie evidence that the sprockets of the Durham and Ledvina necessarily satisfy each and every element of claims 1-19 and 27-31, and necessarily disclose each and every step of method claims 20-26. As the Federal Circuit held in *Robertson* in reversing the Board, "'Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.'" 169 F.3d at 745. *See also* MPEP 2112, §IV, p. 2100-54. Applicant respectfully submits that the Ledvina and Durham do not provide any express or inherent disclosure sufficient to establish that either cited reference necessarily satisfies (or suggests) all of the elements of the claims 1-19 and 27-31.

The offered support for the inherency rejection is the reasoning of paragraph 7 of the Office action, pp. 4-6. The Office action asserts that "any sprocket having different root radii will inherently reduce the tension exerted on the chain." p. 5. The Specification, pp. 4-5, however, explains that this is incorrect in actual practice. The Specification, for example, discusses prior random sprockets with different root radii designed for noise reduction (emphasis added):

> Random sprockets, in contrast, typically have different tensioning characteristics when compared to straight sprockets due to the different root radii. As the chain rotates around the random sprocket, each of the different root radii typically imparts a different tensioning event to the chain. For instance, as a roller of the chain engages a root having a first root radius, the chain may be imparted with a tension different from when a roller of the chain engages a root having a second root radius larger than the first root radius. Tension changes, in addition, may also be imparted to the chain by a random sprocket due to the relative positioning of the different root radii. A roller moving between adjacent roots having the same root radii may result in different chain tension changes than a roller moving between adjacent roots having different radii.

> In a random sprocket having a first, second and third successively larger root radii, the tension imparted to the chain may be greater when a chain roller moves from a root having a first root radii to a root having a third root radii than when a chain roller movers from a root having a first root radii to a root having a second root radii.
>
> ***Thus, random sprockets designed principally for noise reduction often cause increases in chain tensions and tension changes as compared to the maximum tensions imparted to the chain by straight sprockets.*** For example, a random sprocket design may reduce chain noise or chain whine by reducing the pitch order of the sprocket. However, reducing the pitch order of a sprocket may result in redistributing or concentrating the tension forces imparted to the chain by the sprocket over the lower orders of the sprocket. This often results in increased chain tensions corresponding to the lower orders of the random sprocket.
>
> The increased chain tension at the lower sprocket orders frequently cause the overall maximum chain tension force exerted on the chain and sprocket to increase.

The Specification also expressly provides objective data demonstrating the differences between chain drive systems using a "random" sprocket with multiple root radii designed primarily for noise reduction, Example 1, pp. 11 – 12, with an example of one aspect of the invention, Example 2, pp. 15 - 17. As shown in Figure 7, and discussed in the Specification, p. 18, the random sprocket of Example 1 (labeled "STET", the top line) and the claimed shaped sprocket of Example 2[1] (the bottom line) were compared with a straight sprocket (the middle line). The random sprocket of Example 1 with differing root radii produced significantly ***greater*** chain tensions than the straight sprocket, particularly at

---

[1] The sprocket of Example 2 also is an example of one aspect of the claimed invention designed for tension reduction ***and*** noise reduction; therefore the graph for that sprocket in Figure 7 is labeled "Random Sprocket Designed to reduce maximum Tension and Noise."

engine speeds of about 4000 rpm where the systems evidenced their maximum chain tensions.

In contrast, the maximum chain tensions in the system with Example 2, an example of one aspect of the claimed shaped sprocket, were substantially lower than the random sprocket of Example 1 throughout the tested range of engine speeds. (Figure 7) At the speeds of about 4000 rpm where maximum tensions were found, the chain tensions in the system utilizing the claimed shaped sprocket were substantially lower than those for both the random sprocket and the straight sprocket systems. (Figure 7). Thus, the Specification provides the affirmative evidence requested by the Office action showing that sprockets with multiple root radii will ***not*** necessarily result in chain tension reductions, but may in fact increase the chain tensions.

This data also confirms that the claimed sprocket and system significantly and unexpectedly reduced chain tensions relative to a straight sprocket without the potentially adverse secondary effects from the use of variations in root radii and/or chain pitch radii such as those shown with the random sprocket of Example 1. There is nothing to suggest in Ledvina or Durham that their root radii patterns could shift tensions to sprocket orders effective to reduce chain tensions in a particular system. They similarly do not suggest that the regular pattern of root radii and pitch radii of the claimed invention would produce the surprising reductions in maximum chain tensions, such as those shown in the Specification, Figure 7.

Applicant also respectfully submits that the Office action's assertion that the sprocket designs of the invention were a "matter of engineering design choice" and that

"one of ordinary skill in the art would produce a similar optimization" could only be reached by improper hindsight. (Office action, pp. 3-4). The references cited as support for that assertion, Durham and Ledvina, do not suggest that their root radii are selected for, or could produce, improved chain tensions or that they could be used to shift or offset the effect of tensions from other sources.

To the contrary, the root patterns in Durham are selected solely to assist in shifting a bicycle chain from one gear to the next, without regard for the effect of such patterns on the chain tension. Durham, similarly, does not discuss, disclose or suggest that its sprocket design would have any utility in an automotive drive system of the claimed invention. Similarly, Durham does not disclose or suggest that its design would avoid undesirable tension fluctuations in a chain operating at variable speeds. Ledvina is directed to noise reduction applications, and as discussed above, such designs often increased chain tensions in automotive drive systems, and thus teach away from the claimed sprockets, systems and methods.

For the reasons set forth above, Applicant submits that Claims 1-31 and 33-48 are in condition for allowance.

Respectfully submitted,
FITCH, EVEN, TABIN & FLANNERY

Jon A. Birmingham
Registration No. 51,222

Date: February 9, 2005
FITCH, EVEN, TABIN & FLANNERY
120 S. LaSalle St., Suite 1600
Chicago, Illinois 60603
Telephone: (312) 577-7000
Facsimile: (312) 577-7007